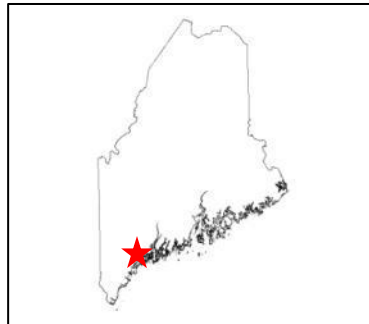


Geologic Site of the Month
August, 2008

Bradbury Mountain, Pownal, Maine



43° 53' 56.56" N, 70° 10' 45.11" W

Text by
Henry N. Berry IV



Introduction

Bradbury Mountain is actually a small, inconspicuous hill, less than 500 feet high. Despite its small size, its panoramic views and convenient location in the southern Maine town of Pownal make it one of the more popular state parks in Maine.



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Bradbury Mountain

Most of the mountain is underlain by igneous rock, namely white granite or its coarse-grained variant, pegmatite. In some places, smaller amounts of gray, layered metamorphic rock are interleaved with the granite and pegmatite.



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Figure 1. View looking north at Bradbury Mountain from Dyer Rd. White ledges of the Summit Lookout are visible.



Map of the Park

The trail map (Figure 2) shows three scenic views: the Summit, Northern Bluff, and South Ridge. Each of these spots has large areas of smooth, bare rock to look at. Geologically, the summit area is most interesting and varied.



Figure 2. Trail map of Bradbury Mountain from Bradbury Mountain State Park web site: [pdf format](#)

Summit Lookout

The Summit Trail begins near the parking lot north of the picnic shelter and ascends directly uphill for 0.2 miles from the trailhead to the summit.



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Figure 3. Beginning of the Summit Trail, marked by white blazes.



Summit Lookout



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Figure 4. Large, bare rock outcrop of white granite and pegmatite at the Summit. Views to the southeast extend to parts of northern Casco Bay.

North Bluff Lookout

The Northern Loop Trail begins at the north end of the northern parking lot, near the mown playing field. It connects to several trails on the northern flank of the mountain, and provides access to the North Bluff Lookout.



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Figure 5. Northern Loop trailhead. This trail is marked by blue blazes.



North Bluff Lookout



Figure 6. The North Bluff Lookout is another outcrop of white granite and pegmatite with a steep southeast side.

South Ridge Lookout

The South Ridge trail begins at the southern parking lot, near the group camping area. It is marked by red blazes. It ascends gradually at first, then follows the base of the rocky ridge before climbing more steeply up to the lookout.



Figure 7. Much of the upper part of the South Ridge trail is on bare rock.

South Ridge Lookout

During the last Ice Age, glacier ice covering the whole of New England flowed southward toward the Gulf of Maine. The moving ice gradually eroded the underlying bedrock to produce shapes like the one seen here, with a gently-sloped northern side (to the right in Figure 8), and a steeper southern side (to the left). All of the steep cliffs and bluffs on Bradbury Mountain face to the southeast, in the direction that the glacier ice moved.



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Figure 8. The scenic lookout on the South Ridge trail is from this smooth, rounded outcrop of pegmatite.



Feldspar Quarry

Near the beginning, the Northern Loop trail passes an old feldspar quarry. Overgrown piles of broken rock are clues to the past activity.



Figure 9. Sign marking the trail to the feldspar quarry, off the Northern Loop Trail.

Feldspar Quarry

Feldspar is the most abundant mineral in granite, and in pegmatite the individual feldspar crystals can be very large. Feldspar was mined from pegmatite bodies like this in many places across southern Maine, and especially in the Topsham area, in the early 1900's.



Photo by Henry N. Berry IV

Figure 10. The quarry itself, now overgrown with large trees, is about 150 feet long, 20 feet wide, and 10 feet deep. This picture was taken from the bottom of the quarry. The side wall of the quarry is visible to the right.

Feldspar Quarry

It was crushed and separated to be used in making ceramics or as an abrasive. By the mid-1900's, feldspar mining had moved to other parts of the country and the world, and the small Maine quarries became inactive. [Current feldspar production and uses](#) (U.S. Geological Survey)



Figure 11. Large block of feldspar at the quarry. Feldspar is white, and breaks in three directions approximately perpendicular to each other to produce angular, blocky pieces like this one. (The top surface is partly covered with moss and lichen.)

Igneous Rocks

Most of the bedrock on Bradbury Mountain is granite, or its coarse-grained variant, pegmatite. These are igneous rocks, which means that they formed from molten rock which cooled and solidified.



Photo by Henry N. Berry IV

Figure 12. Rock texture. The white minerals (feldspar) and gray minerals (quartz) are intergrown in a mosaic pattern. This is typical of minerals which crystallize slowly from a melt. (Note dime for scale.)

Igneous Rocks

These particular igneous rocks cooled slowly beneath the earth's surface, which allowed the individual mineral grains to grow large. These rocks formed hundreds of millions of years ago, and during the ensuing millennia the overlying rock has been eroded to expose these deep rocks at the surface.



Photo by Henry N. Berry IV

Figure 13. Biotite plates. The black mineral is biotite, a black mica. Such large minerals in a random pattern like this occur in pegmatite.

Igneous Rocks



Photo by Henry N. Berry IV

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Figure 14. A large, white feldspar grain intergrown with large, black biotite grains.

Igneous Rocks

Having granite and pegmatite mixed together as in Figure 15, in patches and streaks, indicates dynamic flow of molten rock and fluids during the time the rock was solidifying.



Photo by Henry N. Berry IV

Figure 15. The lens is resting on granite, which has relatively small mineral grains the size of sand. The upper part of the picture shows pegmatite, with very large mineral grains several inches across.

Igneous Rocks



Photo by Henry N. Berry IV

Figure 16. Graphic granite. This particular texture of gray quartz intergrown with white feldspar is known as "graphic" texture. It has been produced in the laboratory by cooling molten rock, so quartz and feldspar form at the same time.

Metamorphic Rocks

At a few places on Bradbury Mountain, metamorphic rocks are found within the granite and pegmatite. The metamorphic rocks are older rocks that were intruded or engulfed by the younger molten rock. They are preserved as thin layers or fragments within the granite and pegmatite.



Photo by Henry N. Berry IV

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Figure 17. These overhangs next to the Summit Trail are where thin layers of metamorphic rock have been more deeply eroded by weathering. The granite and pegmatite are more resistant to erosion, and form the steep, solid outcrop.



Metamorphic Rocks



Photo by Henry N. Berry IV

Figure 18. A thick sequence of metamorphic rock, in the cliff face beneath the Summit Lookout, above the Switchback Trail. The thin, flat layers characteristic of metamorphic rock are seen here. The rock breaks along the layers into slabs. There is granite and pegmatite above here, and below here on the steep cliff face.

Metamorphic Rocks

Figure 19. Close-up of the metamorphic rock shown in Figure 18. These layers were originally sedimentary rock - sandstone and siltstone - that have been converted by heat and pressure inside the earth into metamorphic rock. As metamorphic rocks, the mineral grains have been recrystallized into a microscopic texture somewhat like granite, so that the rock has been hardened. The sedimentary aspect is preserved in the thin layers of different composition.

References and Additional Information

[Bradbury Mountain State Park](#) (Maine Department of Conservation) - Official web site with trail maps, fee and reservation information.

[Bradbury Mountain State Park](#) - Events, information, and volunteer opportunities at the park.

[On the Origin of Graphic Granite \(pdf format\)](#) - Technical mineralogical journal article by Philip M. Fenn.

